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Analysis of an industrial internship in the department of mechanical engineering with servqual, kano, and quality function deployment

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Abstract. *The objective of this study is to examine: (1) the real implementation of an industrial internship in Vocational High School 2 Klaten (2) the level of gap between the perceived quality and the expected quality of the implementation (3) attribute importance needed in improving the quality of the implementation (4) priorities that the school management must do for improving the quality. Data analysis used servqual, Kano model and quality function deployment. The data collection techniques were observation, questionnaires, interview, and documentation. The results of this study indicated the average performance based on the rating of students, teachers, and industry under expectation score (priority score). The gap level of tangibles was -0,47, reliability was -0,51, responsiveness was -0,57, assurance is -0,44 and empathy is -0,20. All of the attributes are important to improve the quality of industrial internship program. Prioritized strategies had to be done by school's management were: (1) preparing infrastructure for internship participants (2) determining the feasibility standards of companies involved in the internship program (3) moral development of internship participants (4) determining duties and obligation of the supervisor teachers (5) setting the standard operating procedure of pre-implementation of the program (6) choosing standard activities for internship participants (7) setting the policy of internship's wearpack*

1. Introduction

The social paradigm of vocational education development as economic since vocational education has a significant role in developing modern industry and improving the quality of life of the community. [1] states that vocational education can reduce the rate of unemployment. This is in line with the theory that a Vocational High School is one of the formal education institutions to produce workers equipped with skills and expertise in accordance with the needs of the young generation to obtain employment opportunities for national development purposes. Cooperation between VHS with the world of work is absolutely necessary to meet the demands of learning and effectiveness in producing skillful graduates according to community expectations [2]. This is in accordance with the study presented by [3] which stated that:

With globalization and the liberalization of higher education in Malaysia, universities and colleges face new challenges. Given this head-on competition, universities and colleges have no choice but to improve the quality of their programs and graduates so that they can compete globally and attract



students. Higher education is increasingly recognized as a service industry, placing greater emphasis on meeting the expectations and needs of its participating customers namely the students

It is also supported by a study conducted by [4], which concludes that the quality of service in education and training should get full attention. To conclude, in the era of globalization, the secondary schools have no other choice but to develop the quality of the program. This is very important because students must be able to compete in various industry sectors. Information obtained from pre-survey results in BKK, Purwoko and the team from BKK stated that there are problems regarding the quality of Industrial Internship implementation in VHS 2 Klaten. These problems illustrate poor quality in the implementation of Industrial Internship. In facts, according to [5] in the implementation of education, needs and ideas of students should be the main focus. Students are the main reason for the establishment of an educational institution and the reputation of educational institutions is on the students' shoulders.

Drs. Purwoko as the chairman of the program said that the implementation of Industrial Internship from year to year was not effectively assessed. This fact shows that the quality of service in the implementation of the Industrial Internship is still neglected. Quality assessment of industrial practice will result in outcomes in the form of customer satisfaction levels of service. Consumer satisfaction can be achieved by providing good quality. Customer satisfaction results from an evaluation process that compares the expectations of customers with the actual situation regarding the implementation of the Industrial Internship program at VHS 2 Klaten. Considering the importance of service quality for education services business, [6] claimed that it takes hard efforts in order to remain competitive and high quality. With such conditions, it is not enough if the educational institutions depend only on the continuous improvement to maintain and develop their competitiveness. They have to foster innovation. Therefore, a quality service study usually performed with Servqual is required. In this study, a quality study of Industrial Internship implementation by integrating Servqual with Kano Model into Quality Function Deployment (QFD). According to Tan and Pawitra in [6], service quality measurement with servqual should be followed by application of QFD to clarify the action plan that must be done to close the gap. Quality of service is formed by the comparison between the ideal with the perception of the quality dimension performance.

The advantage of using these three methods is to focus on improvements that should be made to improve the implementation of industrial practices in VHS 2 Klaten. [7]. This integration aims to assist BKK of VHS 2 Klaten to assess the process of the implementation of Industrial Internship, not only to assess consumer expectations have been met or not but also accelerate the development of service innovation by identifying the attributes and applying them to customer satisfaction. In addition, VHS 2 Klaten is one of the vocational schools with an advanced level of information technology and teaching and learning facilities which should be able to do continuing development and improvement. The identified problems are: there is no assessment of the real condition of the implementation of industrial internship in VHS 2 Klaten, there is no study on the gap between the perceived quality and the expected quality of implementation of the Industrial Internship, there is no data on urgent concerns in improving the quality of the implementation of Industrial Internship, there is no data on priorities to be set by the school management as an effort to improve the quality of the implementation of Industrial Internship. The study was conducted in the even semester of the academic year of 2016/2017 on the students of XIII grade of Mechanical Engineering Department. The data would be used was primary data obtained directly from respondents in the field by directly distributing questionnaires. On Servqual measurement, it was only measured gap 5 that was the gap between the perceived service and expected service by the service users. The QFD stage used consisted of two stages. The student behavioral factors are considered normal based on the information from the school.

This study was aimed to determine the real condition of Industrial Internship implementation in VHS 2 Klaten, the level of gap between the perceived quality and the expected quality of service in the implementation of Industrial Internship, attribute importance in improving the quality, priorities to be conducted by the school as an effort to improve the quality.

2. Method

This study was conducted through a descriptive approach with a combination of quantitative and qualitative studies. The descriptive approach according to philanthropist [8] has the meaning of a study that refers to the transformation of raw data into a form that is easily understood and translated. The study was conducted in Klaten Regency at VHS 2 Klaten.

The population in this study consisted of 45 students of VHS 2 Klaten in the Program of Mechanical Engineering, 20 involved industries from Klaten Regency, 26 teachers assigned as BKK managers in VHS 2 Klaten. To determine the sample in this study the researcher refers to the table of the number of samples based on krejcie and morgan tables. Therefore, it was decided the number of students in VHS 2 Klaten was 45 students, the industries involved in Industrial Internship program in Klaten Regency were 20 industries, the managers of BKK in VHS 2 Klaten is 26 teachers.

2.1 Data collection techniques

The first data collection technique was observation. The second technique was administrating questionnaires. The third technique was an interview. The last was documentation which was conducted by collecting secondary data in the form of documents of industrial practice activities.

2.2 Research Instruments

Questionnaires were required to obtain research data. The research instrument is a measuring instrument used by researchers in collecting data. According to [7], the steps of combining Servqual and Kano Models, and the integration into House of Quality in QFD are presented in Figure 1

Table 1. Research Instruments

Indicators	Aspects	Item
<i>Tangible</i>	Students	37,53
	Supervisor and the school	1,2,3,4,5,6,7,8,10,38,54
	Industry	9,39,40,41
<i>Reliability</i>	Students	56,57,58
	Supervisor and the school	11,12,13,14,15,44,55
	Industry	42,43,45,59
<i>Responsiveness</i>	Students	60,61,62
	Supervisor and the school	16,17,18,19,20,21,22
	Industry	46,47,48,49
<i>Assurance</i>	Students	64, 65
	Supervisor and the school	23,24,25,26,27,28,63
	Industry	29,30,31,50,51
<i>Empathy</i>	Students	67,68,69
	Supervisor and the school	32,33,34,35,36,66
	Industry	35,52

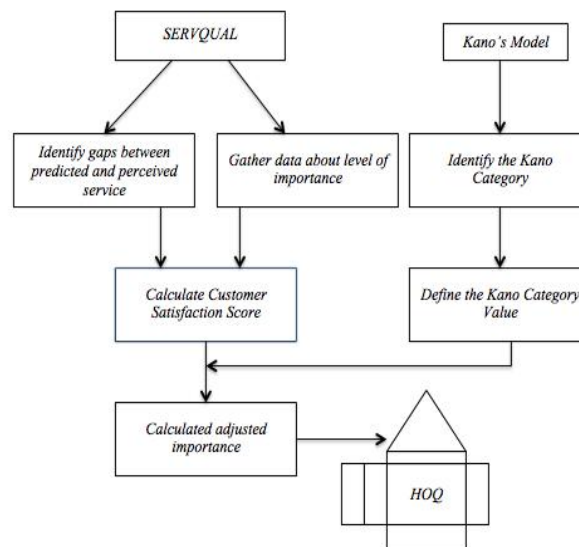


Figure 1. Work Framework in Combining Servqual Method, Kano Method, and QFD

3. Result and Discussion

Validity tests include content validity and construct validity. The instrument used in this study had been validated by expert judgment. The validity of the constructs was measured using Bivariate Pearson. All grains were declared valid. Reliability testing was used reliability formula by Alpha coefficient formula Reliability is to test the reliability of the items that are considered valid or invalid variables [9]. The result of the reliability test is reliable if the coefficient value of alpha obtained was bigger than the table with 5% significance. The results showed that all instruments in this study were reliable. Based on the results of interviews and observations on the students, schools, and industries, it can be identified 69 attributes of Industrial Internship services that become Customer requirements in the implementation of industrial practices. Identification is based on the 5 components of service quality, namely: Tangibles, Reliability, Responsiveness, Assurance, and Empathy.

Table 2. Expectation, Performance and Gap of Each Dimension

No	Dimension	Expectation	Performance	Gap
1	<i>Tangible</i>	4,213	3,74	-0,47
2	<i>Reliability</i>	4,18	3,67	-0,51
3	<i>Responsiveness</i>	4,16	3,59	-0,57
4	<i>Assurance</i>	4,32	3,88	-0,44
5	<i>Empathy</i>	4,26	4,06	-0,20
	<i>Mean</i>	4,228	3,79	-0,44

The obtained data indicated that the gap score obtained by service attribute in industrial practice is <0 . It means performance attribute of service of industry practice was still below the expectation or the expectation value. It can be said that the implementation of the Industrial Internship did not satisfy the subjects of the implementation. This is because the service can be called satisfactory is if there is a positive gap score, whereas if the negative score gap means the quality of service cannot

satisfy the service users. Whereas if the score the gap is 0, it means the quality of service is in accordance with the expectation of the service users.

Although the negative gap is small, or the minus value is not too large it is still not satisfactory. Servqual adopts a zero-tolerance system in its implementation. So, all attributes are still below satisfactory quality. Based on the expectations and judgments obtained for each dimension, then the classification of qualities for each dimension can be seen from Table 3.

Table 3. Quality of Service

No	Dimension	Expectation	Performance	Q = P/E
1	<i>Tangible</i>	4,213	3,74	0,89
2	<i>Reliability</i>	4,181	3,67	0,88
3	<i>Responsiveness</i>	4,163	3,59	0,86
4	<i>Assurance</i>	4,320	3,88	0,90
5	<i>Empathy</i>	4,262	4,06	0,95
	<i>Mean</i>	4,228	3,79	0,90

Based on the calculation of the quality of each dimension in Table 3, the quality is categorized as good if $(Q) \geq 1$ then the service implementation of the Industrial Internship was still not good. Therefore it is necessary to improve the service attributes. In doing the improvement, it is better to prioritize attributes that can increase customer satisfaction. Therefore, the next stage attributes of industrial practice service quality will be analyzed by a Kano model.

In the analysis using the Kano model, there is a classification of service attributes, because basically, Kano Model is to do the classification by looking at the relationship between the level of customer satisfaction over service attributes and the degree of fulfillment of the service attribute itself. By classifying the service attributes, the service attributes can be divided into 6 categories namely A (Attractive), O (One Dimensional), M (Must Be), I (Indifferent), Q (Questionable), and R (reverse). The results of the Kano data processing showed that there were several attribute categories that emerged, among others: there were 43 attributes that belong to category O, there were 20 attributes that must be (M) category, there were 2 attributes that enter category A (attractive), there were 2 category I (Indifferent). Based on the Kano analysis results, there were two indifferent variables (their existence is not important) namely variables 44 and 54 that are conformity of materials delivered in the school with works in industrial internship and the existence of MoU between the industry and the school. The emergence of two variables that enter into this indifferent category can be caused by several factors among others: respondents did not understand the advantages and disadvantages of the MoU in the implementation of Industrial Internship. When filling the questionnaires respondents consider that MoU is not significant and conformity between materials delivered in the school and industry is not important. According to the interview, the industry is not too concerned with the hard skills of students but more on soft skills. The teachers of VHS 2 Klaten had the same opinion in this case.

Therefore, these variables were not included in data processing using the Quality Function Deployment method because the existence of these attributes would not increase the satisfaction of stakeholders of the Industrial Internship. The integration of Service Quality method with the Kano method was to complement each other and cover the weakness owned by each method. Kano model covered the weakness of existing linear assumption on servqual method, while on the other hand,

servqual could give an explanation about the attributes performance and the gap score of each of these attributes.

For example, using Kano methods, it can be seen that it is not fully assumed that the level of customer satisfaction will be linear with the level of fulfillment of service attributes that become consumer needs as analyzed in the servqual method. This assumption by Kano is not entirely correct because the assumption applies only to attributes of category O. On the other hand, the Kano model only focuses on the classification of products or service attributes. In the Kano model, it is not given a clear picture of the performance of the attributes and we will not find a gap score as the description. By using a servqual method, it can be seen the performance of 69 service attributes that exist with the gap score obtained. With the Kano model, we can classify which attributes should be developed and what strategy should be done based on those results, the service attribute that belongs to category A must be developed as this attribute is an innovative process. While attributes that have a positive score and category M should be used as a strength, therefore, the quality of these attributes must be maintained in accordance with consumer expectations. This is because it is a basic attribute that must meet customer expectations, as well as service attributes that category O should be developed and maintained.

Nevertheless, the results of data processing showed that all of the existing service attributes have a negative gap score, and this was a weakness that exists in the implementation of Industrial Internship. The attribute that has a negative score gap and category M, then the quality of the attributes must be improved to meet the consumer expectations. While the attributes with category O and negative score, then the quality of the attributes must be improved so that it can exceed the desire of consumers.

The result of QFD Level one is the attributes rank results from servqual and Kano model analysis

Table 4. Quality Function Deployment Level

Technical Response	Weight
The appearance of Industrial Internship participants and teachers	4,2
The ease implementation Industrial practice	16,7
Participants' readiness	20,0
Attention from the school	21,3
Involved Industri Company Reputation	8,1
Industry commitment to support the Industrial Internship Program	18,1
The School Reputation	11,6

The QFD Level 1 results show that attributes with the highest importance value are attributes of attention from the school. The 2nd level HOQ matrix explains what the engineering parameters are and how to meet them. This matrix is made based on the merger of data processing from the determination of the weight of normalization to the interaction of process requirements Based on HOQ level 2 results, the priority of the process needs are to provide facilities for the participants, to determine feasibility standards for involved companies, moral development for the participants, to

determine the duties and obligations of supervising teachers, to write SOP of pre-implementation, to determine the standards for Industrial Internship activities, to establish the policy of internship participants' wearpack. A summary of the results can be seen in Table 5.

Table 5. The Relationship between *Servqual Method*, *Kano Model*, and QFD

<i>Servqual</i>	<i>Kano Model</i>	QFD
The result of the Servqual method is that all service attributes in industrial practice are still below consumer expectations. This indicated by the gap in all attributes. This means all attributes must be entered to continue being further processed with the Kano model.	The Kano model indicates that there are only two attributes that have an attractive or delighter category. Delighter serves as an attribute of consumer satisfaction that becomes an added value in the implementation of the industrial internship. There are two attributes that have indifferent categories which mean the customer is not concerned with the existence of these attributes.	Quality Function Deployment in the final form of a House of Quality has the conclusion that there are seven priorities for improving service quality in the industrial internship

4. Conclusion and Suggestions

4.1 Conclusion

The real condition of the implementation of the Industrial Internship is considered poor. Because in all the attributes expressed in the statements, there is still a gap between perception and expectation. When customer expectations are not met then customer satisfaction is not achieved. It means in this case, customer satisfaction has not been achieved although there are attributes with small gaps. There is still a gap between perception and expectation measured using servqual method and the Kano model. This was proven by negative values of customer satisfaction scores in all attributes. All attributes have an important capacity to improve the quality of the implementation of Industrial Internship especially the attributes that have the category attractive, one dimensional, and must be. All Kano attributes are continued to be combined with servqual to find the value of adjusted importance, the priorities that school management needs to do in improving the quality of the implementation of Industrial Internship are: to provide facilities and infrastructure for Industrial Internship participants, to determine feasibility standards of the companies involved in the Industrial Internship Program, moral development for the participants, to determine the duties and obligations of supervising teachers, to determine SOP of pre-implementation of the program, to determine the standard activities of Industrial Internship participants, and to do establish the policy of internship participants' wearpack.

4.2 Suggestion

To improve the service quality in Industrial Internship, the school should prioritize improvements on: providing facilities and infrastructure for Industrial Internship participants, determining the feasibility standards of the companies involved in the Industrial Internship, moral development for Industrial Internship participants, determining duties and obligations of supervising teachers, make SOP of pre-implementation of the Industrial Internship, determining the standard activities of Industrial Internship participants, establishing the policy of internship participants' wearpack. In the Kano Model, where two indifferent categories are found. It is better for the school to study the cause of the existence of the category. It is necessary to conduct further research on the application of Servqual,

Kano Model and Quality Function Deployment method in VHS 2 Klaten to improve the quality of Industrial Internship services.

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